Capability Guide

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MOTOTRBO™ Linked Capacity Plus

Avtec's Scout console system supports MOTOTRBO™ Linked Capacity Plus (LCP). Linked Capacity Plus is Motorola's mid-tier, multi-site, digital trunking radio system linking adjoining sites across an IP network. Scout's Linked Capacity Plus endpoints provide dispatchers the ability to communicate via Wide Area Group, Local Group, and All Call connections.

Scout console positions connect to the Linked Capacity Plus radio system via VPGate and the Avtec Routing Controller (ARC). Each talkgroup that the consoles need access to requires a valid endpoint license. VPGate licenses are offered in 30, 60 or 100 endpoint sizes.

Capabilities-at-a-Glance

In addition to all the standard features of Scout console, the following MOTOTRBO™ Linked Capacity Plus features are available to the dispatcher:

Capability	Description
Activity History with Instant Recall Recorder (IRR)	Activity History and IRR are Scout tools that let the dispatcher see a list of past conversations and replay audio from past conversations for analysis or clarification using Instant Recall Recorder. Instant Recall Recorder is an optional feature of Scout.
Connection	Scout uses a wire-line console interface through a direct IP connection to Motorola XPR™ 8400.
Group Call	Group Calls allow the Scout Console to affiliate with a group of subscriber radios for the purpose of establishing voice communication between the dispatcher and the group of subscribers. All members of the group hear the conversation.
Emergency Group Call (inbound)	An Emergency Call is a call with a higher priority level than a regular call. When pressed, the emergency button on a subscriber unit signals Scout to perform two actions. First, the driver sends an emergency alarm to the Scout Console, which can only be cleared by the dispatcher touching the Emergency Clear pad on the Scout Console User Interface. Second, the driver creates an emergency call to the Scout Console.
All Call	An All Call is sent to all subscribers on the MOTOTRBO™ system.
Keying Progress Indications	Scout presents an audible indication to the dispatcher for Granted, Queued, Failed, or Canceled PTT requests.

Capability	Description
Patch	Patching allows a dispatcher to connect a group or unit to other radio or telephone endpoints so that the subscriber units can communicate with units using other communication methods. This establishes a communication path between two or more radio or telephone endpoints that are normally unable to communicate with each other.
PTT ID with Alias	PTT ID displays the subscriber unit ID on the associated endpoint pad and in the Activity History. PTT ID Alias changes the PTT ID from a numerical ID to an alphanumeric string. For example, PTT ID 2527 can be displayed as "Fire Engine 27."
Enhanced Privacy/Encryption	Enhanced privacy is encryption/decryption of dispatcher/endpoint voice signals when transmitted/received, making eavesdropping on conversations difficult. It is typically used in applications where tactical decisions are being discussed in a group such as a police or military action where the decision reached on the action to be taken has to remain confidential until the action occurs. Encryption settings and key lists for enhanced privacy/encryption are managed through the Avtec Encryption Key Manager. Avtec does not charge a separate licensing fee for the enhanced privacy/encryption capability unless using the Key Management Facility (KMF). A KMF access license must be acquired to enable the KMF feature.
Alert Tone	Scout has the capability to generate alert tones to various endpoints, including P25 radios. These tones include: ▪ Keying Tones Scout can also send alert tone specifications as an alternative to .wav files for an endpoint. This is primarily used for P25 endpoints but can also be used for other conventional endpoints when alert tone .wav files cannot produce the desired audible tone.

Note: To ensure reliable operation with Scout, use MOTOTRBO™ Linked Capacity Plus firmware version 2.2B, subscriber version R02.06.21 for portables, and R02.06.20 for mobiles.

Note: Software must be installed on computers running either Windows 7 or Windows Server 2008. Encryption libraries that LCP uses are not supported on computers running the Windows XP operating system.

Connections

A MOTOTRBO™ Linked Capacity Plus system consists of one or more MOTOTRBO™ digital repeaters configured to intercommunicate. All the repeaters in the system are peers of one another. Each repeater transmits RF-received voice and data packets over the IP network to all other registered peers in the system.

The Scout console system interfaces with Linked Capacity Plus through the VPGate MOTOTRBO™ Linked Capacity Plus driver. The driver provides options for settings unique to the Linked Capacity Plus system such as:

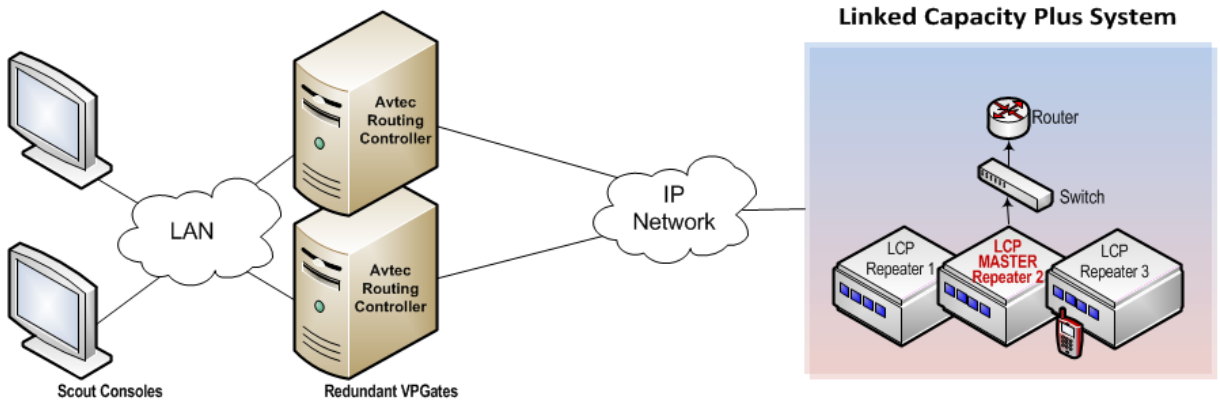
- Timing of keepalive messages
- The type of connection for the endpoint
- Encryption settings

VPGate connects to the Linked Capacity Plus system through the Avtec Routing Controller by registering the static IP address of the repeater acting as the Master peer. This Master peer obtains system information which includes both the IP address and port of all the repeater peers and the site IP addresses of all the sites. Using the IP addresses and ports of the repeater peers, VPGate registers with interested repeaters in any site and exchanges keepalive messages with them through the repeater interface. After joining the system, repeater peers also get

the updated system information, register with VPGate, and exchange keepalive messages to keep the firewall open.

Basic Configuration

In a basic setup, the Scout consoles connect to VPGate, which connects to an available Avtec Routing Controller either locally or over the same Local Area Network (LAN). The Avtec Routing Controller then connects to the MOTOTRBO™ Linked Capacity Plus system. Linked Capacity Plus connects to radio repeaters over IP.

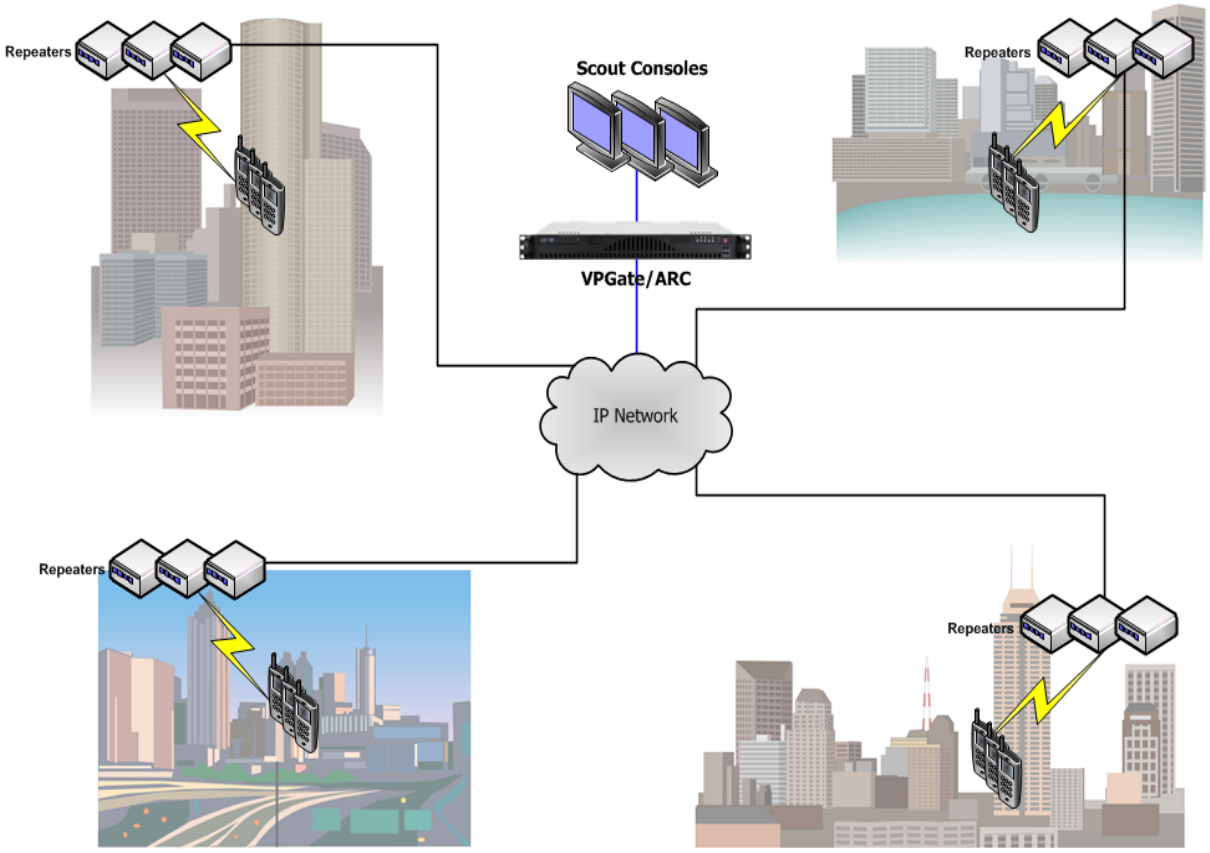


The diagram above shows a typical setup for the Scout console system and the Avtec Routing Controller that provides the connectivity to the MOTOTRBO™ Linked Capacity Plus system.

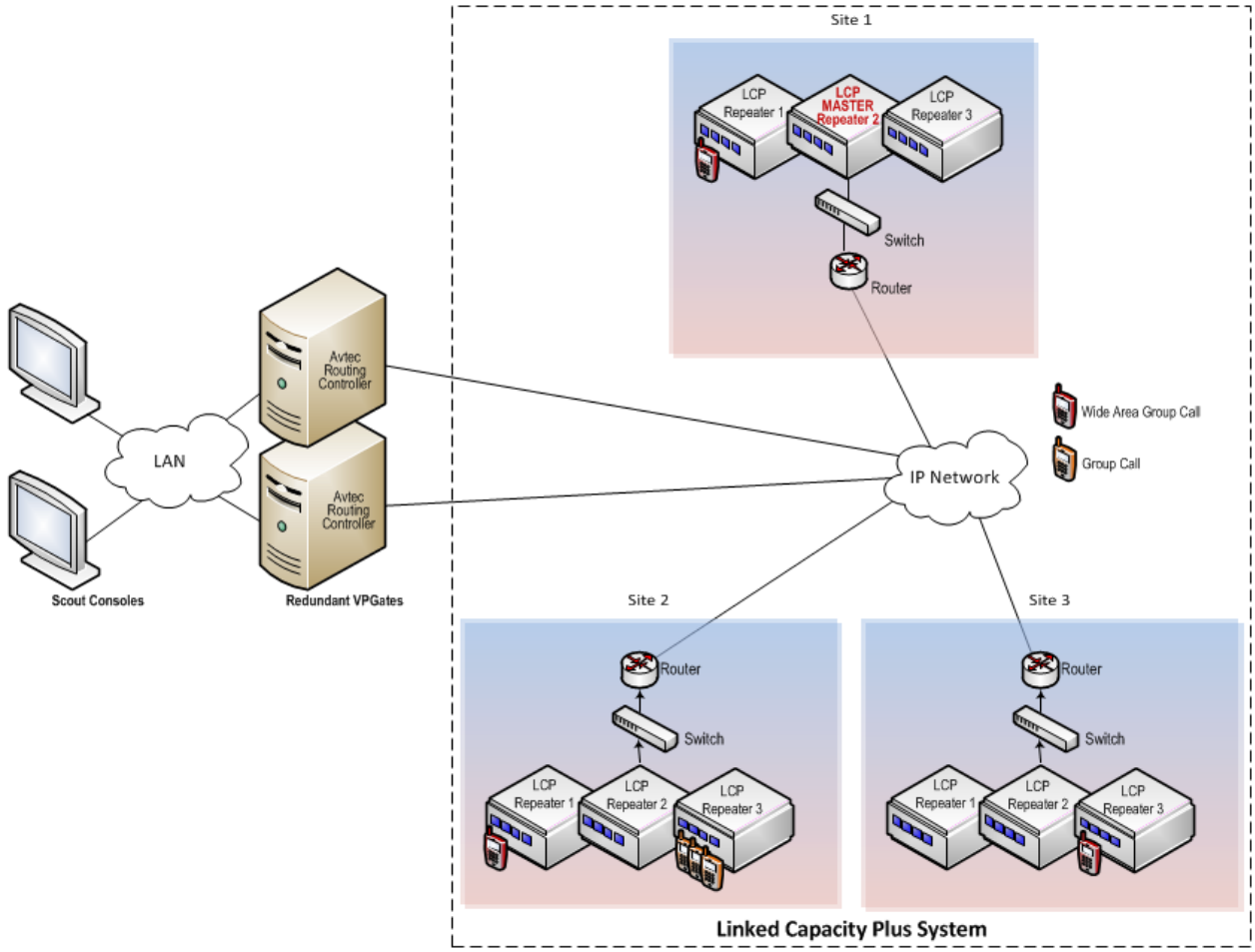
The following illustrations show some typical applications for Scout with Linked Capacity Plus. Refer to Motorola's *MOTOTRBO™ System Planner* document for detailed information about different Linked Capacity Plus configurations.

Geographically Distributed Sites

The MOTOTRBO™ Linked Capacity Plus solution supports a geographically distributed radio network, also called a *wide area system*, with multiple repeaters. With scout consoles in a single communication center, an organization can coordinate activity in multiple remote locations.



Multi-Site MOTOTRBO™ Linked Capacity Plus System



This multi-site layout illustrates the use of VPGate's Avtec Routing Controller to connect to multiple MOTOTRBO™ Linked Capacity Plus sites. Notice that Scout interfaces to this multi-site trunking system in the same way that it would with a single-site trunking system. Linked Capacity Plus hides the details of the site configuration from Scout; Scout cannot tell if there is one MOTOTRBO™ site or multiple sites.

Scalability

The design for a Scout–MOTOTRBO™ Linked Capacity Plus system is determined by the number of endpoints required and the number of consoles that require access to those endpoints. An endpoint is an IP talkpath between the console subsystem and the radio subsystem. When designing a system, the number of desired endpoints and geographical locations for consoles determines the number and type of the licenses needed. Review the information below to understand how the various components in a Scout–MOTOTRBO™ Linked Capacity Plus system scale.

- A single Scout system supports up to 200 consoles and 2000 endpoints.
- One VPGate bundled with MOTOTRBO™ Linked Capacity Plus software license controls 40, 80, or 160 total endpoints, depending upon the license purchased. Of the total endpoints in the license, up to 30, 60, or 100 endpoints, respectively, are MOTOTRBO™ Linked Capacity Plus endpoints.
- A total of 30 simultaneous talkpaths are supported per VPGate.

MOTOTRBO™ Linked Capacity Plus trunked radio networks can be scaled from a single site with a few channels to a wide area system covering large geographic areas.

- A MOTOTRBO™ Linked Capacity Plus configuration supports up to a maximum of 15 sites, including Scout console gateways. Each site supports a maximum of 8 trunked repeaters and a maximum of 12 data revert repeaters; however, the total number of repeaters cannot exceed 12. For example, if we have 8 trunked repeaters, we can only have 4 data revert repeaters. (All repeaters and peers in the system, with the exception of the data revert repeaters, require additional licensing that must be obtained from Motorola or an authorized vendor.)

Licensing

Implementing a Scout–MOTOTRBO™ Linked Capacity Plus (LCP) system requires software licensing for both the Scout console system and the MOTOTRBO™ Linked Capacity Plus system. Motorola requires two licenses for all repeaters and all peers in the system (obtain these licenses from Motorola or an authorized vendor). Avtec licenses are sold in capacity levels detailed below.

The MOTOTRBO™ Linked Capacity Plus driver is licensed as a supplemental VPGate driver and uses a variation of the base VPGate license requiring its own USB hardware dongle. The license size represents the number of active endpoints that VPGate and MOTOTRBO™ Linked Capacity Plus control. This VPGate license is available in three sizes: 40, 80, or 160 total endpoints. The following table lists the license options and the maximum number of endpoints of each type the license allows.

Avtec Model Number	Category A/ Total Endpoints	Category B Endpoints	MOTOTRBO™ Linked Capacity Plus Endpoints	Redundant
SFW-VPG-MTCP-L1	40	20	30	Yes
SFW-VPG-MTCP-L2	80	40	60	Yes
SFW-VPG-MTCP-L3	160	100	100	Yes

For every LCP endpoint configured on a VPGate system, one VPGate Category A endpoint plus one Supplemental Driver license is used from your available totals.

Note: For each MOTOTRBO™ LCP license used, a corresponding Category A license is also used. For example, if you configure 10 MOTOTRBO™ LCP endpoints in your system, 10 of your Category A endpoints are allocated.

Refer to the VPGate Cut Sheet or contact your Avtec sales representative for more information about licensing for Scout and MOTOTRBO™ Linked Capacity Plus endpoints.

Network Requirements

The MOTOTRBO™ Linked Capacity Plus network can be a local area network (LAN) or a wide area network (WAN) connection provided by an Internet Service Provider (ISP). Most customer networks are a combination of both types. Scout can connect to a Linked Capacity Plus endpoint using a Local Group, Wide Area Group or All Call slot.

Note: The network cannot use a Proxy server that directs all IP devices to a home or logon page before they are allowed access to the WAN.

Jitter

Linked Capacity Plus allows a jitter tolerance of 60 milliseconds (ms). If a delay of more than 60 ms occurs, audio quality begins to degrade. Scout allows for jitter ranging from 60 ms to 2.5 seconds.

Note: Packet loss and latency must be within the limits documented in the *MOTOTRBO™ System Planner* document from Motorola. The network cannot use a dial-up connection because of inadequate bandwidth. It also should not use satellite Internet access, such as a VSAT system, due to unacceptable delays during transmission and reception.

Bandwidth

Sufficient bandwidth must be available on the IP network. A fully populated repeater network can require more than 700 kbps.

Quality of Service

VPGate supports Differentiated Services (DiffServ) values for audio and control packets from the VPGate to the MOTOTRBO™ endpoint. This allows VPGate to assign a high priority to VoIP packets and prevent unwanted network delays.

Addresses and Ports

A static IP Address and UDP Port for the master repeater must be made available to all peer devices on the Linked Capacity Plus system.

When a peer device registers with the master repeater, the network supplies the return IP address and UDP port of the peer device to the master repeater. The IP address and UDP port must then be made available to all other MOTOTRBO™ LCP devices on the system.

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